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Agenda Item : 5
Source : Nortel Networks
Title : Discussion on timing relations upon reconfiguration of Transport Format Configuration Set
Document for : Discussion and decision

1. Introduction

This paper discusses the timing relations that must be respected upon reconfiguration of the Transport Format Configuration Set of a CCTrCh. Today, TS 25.212 and TS 25.331 are not in line on these timing relations.

In a first part, the misalignment between the specifications is described. In a second part, a solution is proposed and discussed.

2. Detail of the timing relations as described in TS 25.212, and TS 25.331

In both specifications, the relations are the same for uplink and downlink.

2.1.1. TS 25.212

In TS 25.212, it is specified that, when the TFCS of a CCTrCh is reconfigured, the change can occur only at frame boundaries corresponding to TTI boundaries common to all TrChs of the CCTrCh, including those which are added, reconfigured or have been removed.

This is described in section 4.2.14 of TS 25.212 as follows:

Transport channels multiplexed into one CCTrCh shall have co-ordinated timings. When the TFCS of a CCTrCH is changed because one or more transport channels are added to the CCTrCH or reconfigured within the CCTrCH, or removed from the CCTrCH, the change may only be made at the start of a radio frame with CFN fulfilling the relation

$$\text{CFN mod } F_{\text{max}} = 0,$$

where F_{max} denotes the maximum number of radio frames within the transmission time intervals of all transport channels which are multiplexed into the same CCTrCH, including any transport channels i which are added, reconfigured or have been removed, and CFN denotes the connection frame number of the first radio frame of the changed CCTrCH.

2.1.2. TS 25.331

In TS 25.331, it is specified that when the TFCS of a CCTrCh is reconfigured, the change can occur only at frame boundaries corresponding to TTI boundaries common to all of the affected TrChs of the CCTrCh. This means the TrChs of the CCTrCh which are added, reconfigured or removed. With this definition, the TTI of the TrChs which are multiplexed on the CCTrCh but not "touched" by the change of TFCS, are not taken into account.

3. Discussion on possible solutions to align the specifications

3.1.1. Downlink

TS 25.331 is not correct for downlink. In downlink, rate matching is done on a TTI per TTI basis and there are dependencies between all Transport Channels multiplexed. No modification of a Transport Channel can occur in the middle of the TTI of another Transport Channel of the CCTrCh without spoiling the rate matching calculations.

Therefore, for downlink, TS 25.212 approach should be taken.

Backward compatibility for TS 25.331 will be ensured if the activation time is such that $CFN \bmod F_{max} = 0$, or if all TTIs of the CCTrCh have the same value, or if the TFCS reconfiguration includes one TrCh having the TTI max of the CCTrCh.

3.1.2. Uplink

In uplink, the rate matching is done on a frame per frame basis. Therefore, TS 25.331 is correct in this case. TS 25.212 is also correct, and is a bit more restrictive.

The constraint in TS 25.331 enables in certain cases to apply the change a bit quicker than TS 25.212. If all the TrChs which are "affected" have a TTI shorter than the TTI max in the CCTrCh, the change can occur ($TTI_{max}/CCTrCh - TTI_{max}/affected\ TrChs$) earlier, according to TS 25.331. However, given that the TTI values are among {10ms, 20ms, 40ms, 80ms}, and that TS 25.212 uses the TTI max in the CCTrCh, which is not often 80ms, the gain is not likely to be so significant. Also, applying the change of configuration with a different timing for uplink and downlink might lead to tricky situations in the reconfiguration.

Therefore, from a timing point of view, keeping the same relation for uplink as for downlink, based on TS 25.212 seems to be a reasonable choice.

As for downlink, backward compatibility for TS 25.331 will be ensured if the activation time is such that $CFN \bmod F_{max} = 0$, or if all TTIs of the CCTrCh have the same value, or if the TFCS reconfiguration includes one TrCh having the TTI max of the CCTrCh.

4. Conclusion

This document explained the misalignment for the timing relations to be respected upon reconfiguration of Transport Format Combinations Set. It discussed the possible solutions to realign the specifications. In the end, alignment of TS 25.331 on TS 25.212 seems to be a reasonable choice.

5. References

[1] 3GPP TS25.212 v3.5.0, Multiplexing and channel coding (FDD)

[2] 3GPP TS25.331 v3.6.0, RRC protocol specification